TECHNICAL PROGRESS REPORT

for

JANUARY-MARCH 2007
NOVEL CONCEPTS RESEARCH IN GEOLOGIC STORAGE OF CO_2
PHASE III

THE OHIO RIVER VALLEY CO_2 STORAGE PROJECT

Contract No. DE-AC26-98FT40418

Prepared for:

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ABSTRACT

As part of the Department of Energy's (DOE) initiative on developing new technologies for the storage of carbon dioxide (CO_2) in geologic reservoirs, Battelle has been investigating the feasibility of CO_2 sequestration in the deep saline reservoirs of the Ohio River Valley region. In addition to the DOE, the project is being sponsored by American Electric Power (AEP), BP, Ohio Coal Development Office (OCDO) of the Ohio Air Quality Development Authority, Schlumberger, and Battelle. The main objective of the project is to demonstrate that CO_2 sequestration in deep formations is feasible from engineering and economic perspectives, as well as being an inherently safe practice and one that will be acceptable to the public. In addition, the project is designed to evaluate the geology of deep formations in the Ohio River Valley region in general and in the vicinity of AEP's Mountaineer Power Plant, in order to determine their potential use for conducting a long-term test of CO_2 disposal in deep saline formations.

The current technical progress report summarizes activities completed for the January-March 2007 period of the project. As discussed in the report, the main accomplishment was an announcement by AEP to move forward with a ~100,000 metric tons CO_2/year capture and sequestration project at the Mountaineer site. This decision was the outcome of last several years of research under the current DOE funded project involving the technology, site-specific characterization, modeling, risk assessment, etc. This news marks a significant accomplishment for DOE's research program to translate the theoretical potential for carbon sequestration into tangible measures and approaches for the region. The program includes a 30-megawatt thermal product validation at the Mountaineer Plant where up to 100,000 metric tons CO_2/year will be captured and sequestered in deep rock formations identified in this work. Plans include further steps at Mountaineer with capture and storage at a very expedited pace. Work continued on the design and feasibility support tasks such as development of injection well design options, engineering assessment of CO_2 capture systems, permitting, and assessment of monitoring technologies as they apply to the project site. Overall, the current design feasibility phase of the project has reached a major milestone. Plans to facilitate the next steps of the project will be the main work remaining in this portion of the project as the program moves toward the proposed capture and sequestration system.

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EXECUTIVE SUMMARY

This Quarterly Technical Progress Report for Contract DE-AC26-98FT40418 has been prepared in accordance with the requirements of the National Energy Technology Laboratory (NETL). The reporting period for the current document is January-March 2007.

The purpose of this project is to evaluate the geology of deep formations in the Ohio River Valley region and to conduct a long-term test of carbon dioxide (CO_2) injection/storage in deep saline formations at an active power plant site. The current technical progress report summarizes activities completed for the January-March 2007 period of the project. As discussed in the report, the main accomplishment was reaching agreement with AEP to move forward with a 100,000 metric tons CO_2/year capture and sequestration project at the Mountaineer site. The agreement was supported by DOE funded work on this project involving the technology, site-specific characterization, modeling, risk assessment, etc. This news marks a significant accomplishment for DOE to translate the theoretical potential for carbon sequestration into tangible measures and approaches for the region. The program includes a 30-megawatt product validation at the Mountaineer Plant where up to 100,000 metric tons CO_2/year will be captured and sequestered in deep rock formations identified in this work. Plans include further steps at Mountaineer with capture and storage at a very expedited pace. Work continued on the design and feasibility support tasks such as development of injection well design options, engineering assessment of CO_2 capture systems, permitting, and assessment of monitoring technologies as they apply to the project site. Overall, the current design feasibility phase of the project has reached a major milestone. Plans to facilitate the next steps of the project will be the main work remaining in this portion of the project as the program moves toward the proposed capture and sequestration system.

1.0 INTRODUCTION

The main objective of this project is to evaluate the geology of deep formations in the Ohio River Valley region and to conduct a long-term test of carbon dioxide injection/storage in deep saline formations at an active power plant site if the project sponsors see fit. This work supports the overall project objective of demonstrating that CO_2 sequestration in deep formations is feasible from engineering and economic perspectives, as well as being an inherently safe practice and one that will be acceptable to the public.

2.0 EXPERIMENTAL

The main experimental activity undertaken during the reporting period was combined reservoir simulations of CO_2 injection into the Rose Run Sandstone and Copper Ridge Dolomite. Work also continued on design and feasibility support tasks designed to move the project toward an integrated carbon capture and storage system at the Mountaineer site.

3.0 RESULTS AND DISCUSSION

The following section summarizes the major activities and their outcomes for the reporting period under each task of the project.

Task 1 – Geologic Data Assessment

Task 1 includes subsurface geologic assessment in the vicinity of the field site based on pre-existing information. All activities under Task 1 of the Statement of Work have been completed, and Battelle has developed a thorough understanding of the geologic framework for the site's deep saline reservoirs, caprock formations, and coal seams. An Interim Topical Report on the findings was submitted to NETL in August 2003.

Task 2 – Seismic Survey

The main tasks related to the seismic survey have been completed, including design of a survey through injection well site, acquisition of 11 miles of seismic reflection data, data processing, interpretation of the results, analysis of the feasibility of seismic monitoring of CO_2 in the region, and reporting. Remaining elements of Task 2 include final determination of the monitoring arrangements for vertical seismic profiling and passive seismic monitoring, which will be completed at the end of the current phase.

Task 3 – Borehole Drilling and Testing

All major activities associated with Task 3 have been completed. A manuscript describing the borehole injectivity characterization efforts is being prepared for publication in a special AAPG issue on CO_2 sequestration.

Task 4 – Reservoir Simulations

Work began on a large-scale simulation of CO_2 injection into the Rose Run and Copper Ridge formations, including overlying Beekmantown Dolomite caprock. Porosity and permeability data from wireline log data between survey depths of 7655 to 8360 ft bKB were evaluated, in preparation for geostatistical analysis. Four different depth intervals were considered: Lower Beekmantown Dolomite (7655-7755 ft bKB), Rose Run Sandstone (7755-7871 ft bKB), upper Copper Ridge Dolomite (7871-8160 ft bKB), and the Copper Ridge b-zone (8160-8360 ft bKB). The Rose Run sandstone and Copper Ridge b-zone intervals have been modeled previously, and are considered the target intervals. The Lower Beekmantown Dolomite and Upper Copper Ridge Dolomite intervals both have lower porosity and permeability than the target intervals. In addition, plume sizes for injecting 100,000-tonnes/year were evaluated in an effort to determine if the Mountaineer site would be a suitable candidate for the future large-scale injection efforts being considered by DOE and AEP.

Task 5 – Design the Future Injection and Monitoring Facility and Prepare Regulatory Permits

During March, Battelle and AEP reached an agreement to work together on the next phase of the project. The agreement and AEP announcement was the culmination of DOE funded work on this project involving the technology, site-specific characterization, modeling, risk assessment, etc. On March 18, AEP made a major decision and a prominent announcement of their plans for addressing with carbon capture and storage projects at large scale (Figure 1). The announcement of the program was made by AEP CEO during a presentation in New York and followed up with a briefing to the US congressional committee on energy next week. This news marks a significant accomplishment for DOE to translate the theoretical potential for carbon sequestration into tangible measures and approaches for the region. The project is part of the multi-dimensional and multi-technology effort to move forward on carbon capture and sequestration at the Mountaineer Plant and another site in Oklahoma. The program includes a 30-megawatt product validation at the Mountaineer Plant where up to 100,000 metric tons CO_2/year will be captured and sequestered in deep rock formations identified in this work. Plans include capture and storage at Mountaineer at a very expedited pace.

Other work on this task remained focused on pilot-scale capture system assessment for advanced amine systems. Advanced amine systems from Fluor and Mitsubishi Heavy Industry were analyzed in relation to their integration with the sulfur control system being completed at the Mountaineer plant. Battelle met with MHI staff on 20 February to discuss specific technical questions about the KS-1 process, which will complete the analysis of this technology. Aspects related to chilled-ammonia capture system and energy reduction to the plant were analyzed to support moving the project into the next phase.

Task 6 – Risk Assessment and Stakeholder Interactions

Risk Assessment – A manuscript on the Features, Event, and Processes (FEP) risk assessment and integrated risk approach for the Mountaineer site was finalized for the IEA Greenhouse Gas Journal's special issue on CO_2 sequestration risk assessments.

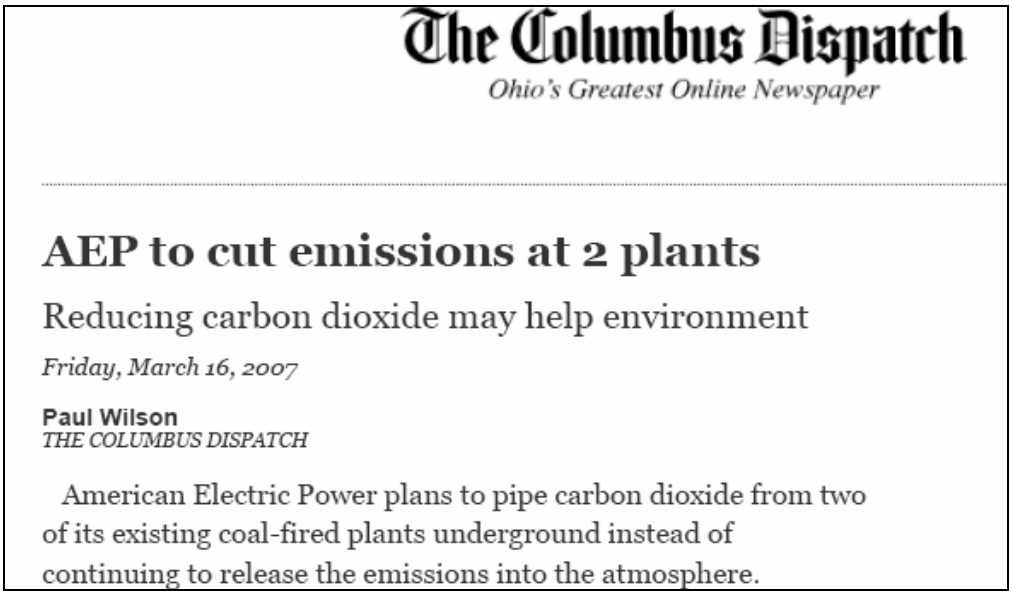
Stakeholder Outreach – Stakeholder interaction activities continued with a main focus on local and regional stakeholders and development of the project announcement materials. The key activities included monitoring various news releases and media reaction to the proposed AEP capture and sequestration project for the Mountaineer site.

Task 7 – Project Briefings and Meetings

- Presented technical and economic aspects of carbon storage to the AEP executive council
- The contract period was extended till September 2007 at no additional cost
- An abstract entitled "Assessment of CO_2 Injection Potential in the Copper Ridge Formation at the Mountaineer Power Plant Site", has been accepted as a poster presentation for the Sixth Annual Carbon Sequestration Conference, May 7 - 10, 2007.

Task 8 – Building the Regional Geologic Framework

No significant activity.



The Columbus Dispatch

Ohio's Greatest Online Newspaper

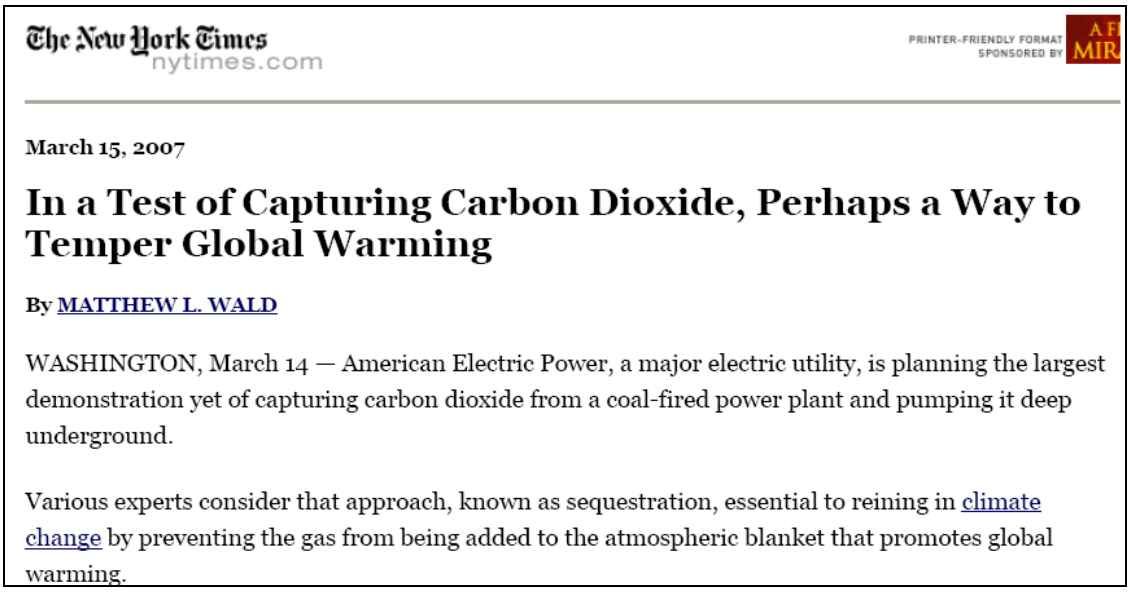
AEP to cut emissions at 2 plants

Reducing carbon dioxide may help environment

Friday, March 16, 2007

Paul Wilson
THE COLUMBUS DISPATCH

American Electric Power plans to pipe carbon dioxide from two of its existing coal-fired plants underground instead of continuing to release the emissions into the atmosphere.



The New York Times
nytimes.com

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March 15, 2007

In a Test of Capturing Carbon Dioxide, Perhaps a Way to Temper Global Warming

By MATTHEW L. WALD

WASHINGTON, March 14 — American Electric Power, a major electric utility, is planning the largest demonstration yet of capturing carbon dioxide from a coal-fired power plant and pumping it deep underground.

Various experts consider that approach, known as sequestration, essential to reining in climate change by preventing the gas from being added to the atmospheric blanket that promotes global warming.

Figure 1: Articles on AEP announcement for carbon capture and sequestration projects.

4.0 CONCLUSION

Overall, the current design feasibility phase of the project has reached a major milestone with the announcement from AEP to move forward with a 100,000 metric tons CO_2/year capture and sequestration project at the Mountaineer site. Substantial progress was also made on pilot-scale capture system assessment for advanced amine systems for a pilot-scale CO_2 capture and injection demonstration at the Mountaineer site. Reservoir simulations were also completed to analyzed proposed injection system for the Rose Run sandstone and Copper Ridge "b-zone." Plans to facilitate the next steps of the project will be the main work remaining in this portion of the project as the program moves toward the proposed capture and sequestration system. As a first-of-its-kind system, this work involves numerous challenges, but diverse resources are being utilized to meet the challenges.

4.1 Future Activities

With the announcement of the capture and sequestration system for the Mountaineer Plant, the project will shift to preparing for this effort. During the next few months, the following areas of emphasis are anticipated:

- Develop plans for proposed 100,000 metric ton/year injection system at the Mountaineer Plant.
- Review and refine all the information compiled and gathered from the site to evaluate how it may aid in moving the project forward at an expedited schedule.
- Completing reservoir simulations of injection in the Rose Run/Copper Ridge dolomite dual-completion options.
- Evaluate injection well and monitoring design scenarios based on modeling results
- Explore avenues for funding of the demonstration phase of the project with DOE and others.

5.0 REFERENCES

No references cited.